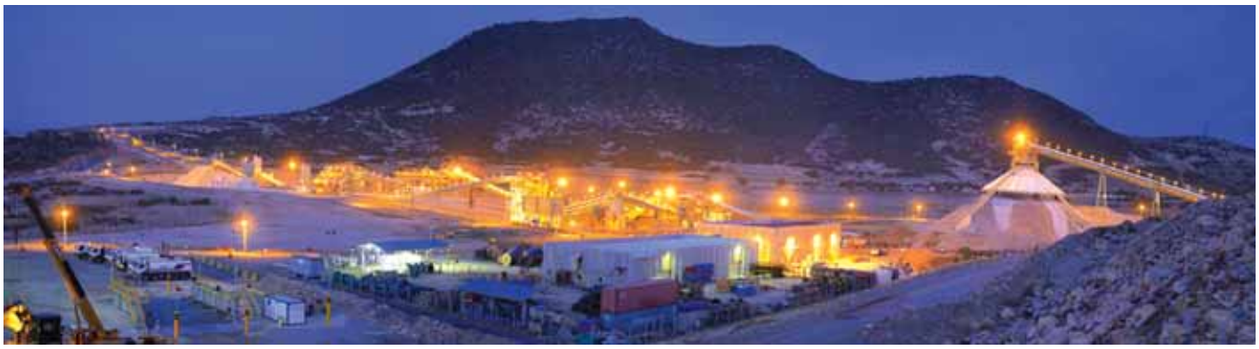
The Need for an Environmental Management System—and What This Means for Mines

Increasingly, mining companies see thorough management of environmental impacts as an important element in the managing of corporate risk and in attracting investment

By Graham Holtom



Data collection and reporting requirements for environmental management of mine properties vary widely from region to region worldwide, and can be error prone, labor intensive and costly as data volume increases. Software solutions can be extremely useful in these situations. Eldorado Gold's Kisladag mine, the largest gold mine in Turkey, uses EHS Data's MP-5 Monitor-Pro software for environmental data management.

In mining, as in many other industries, the drivers of environmental management are many. EHS Data Ltd. provides software solutions to help clients manage data associated with environmental performance, and this article has been written based on the experiences of users from different mining companies and geographies. The most significant environmental impacts at different stages of the mine's life, as identified by clients, are summarized in Table 1.

Mines have an environmental impact which is, of course, obvious. But so what? What are the drivers that require these companies to manage their impacts and what do they actually do?

Permits

The first and most obvious drivers are permits. These impose conditions on an operation which force it to manage its environmental impacts responsibly. There are various regulatory bodies around the world who grant permits that can be something of a minefield to navigate. But navigated it must be since no permit equates to no operation.

In the U.S. and Canada, clients operate under different regulators at regional and federal levels. In Canada, for example, regional regulators include the Ministry of the Environment, Department of Natural Resources and Ministry of Energy and Mines. The types of permit issued may be different at different stages of a mine's life and exploration permits will be granted for drilling and taking of bulk test samples as well as the reclamation of works post-exploration. During construction and operation a single permit exists which will include details of a post-operation reclamation plan. Posting of financial security/bond for eventual reclamation costs may also be needed. The operation permit will usually be amended for closure and aftercare but will, on occasion, be reissued as a reclamation permit. Such is the case for Inmet Mining's closed operation at Samatosum, British Columbia.

In Western Australia, the Department of Mines and Petroleum is responsible as the main regulator at various stages in a mine's life. Construction may also require approval at national government level via the Environment Protection and Biodiversity Act of 1999 which requires an

Table 1

Mine stage	Significant Environmental Impacts
Exploration	Vegetation clearance; impacts on cultural heritage; ground disturbance, water management (e.g. for drilling); weed management; spills and environmental accidents; loss and damage to topsoil required for eventual rehabilitation.
Construction	Land disturbance and local environment compared to baseline; groundwater and surface water; dust; waste management; noise.
Operation	Air Quality (e.g. dust, SO_2 and other emissions from plant); noise; groundwater and surface water impacts; water use, waste rock management and subsequent acid rock drainage and erosion; chemical use; environmental incidents (e.g. spills); waste management (identification and segregation of waste streams, recycling)
Closure aftercare	Seepage and toxic effects from waste rock and tailings; rehabilitation of the site.

Environmental Impact Assessment, project plans and other documentation. Other permit obligations are placed on the operators by the Department of Environment and Conservation and Department of Water.

In Papua New Guinea, mines are regulated by the PNG Department of Environment and Conservation and the PNG Mineral Resources Authority which govern the entire operation. Prior to construction, an Environmental Impact Assessment also needs to be prepared.

In Europe, member states of the European Union must comply with the Integrated Pollution Prevention and Control regime and issue permits which consider a mass balance of impacts to the environment (air, land and water). These are administered by the regulatory bodies in each member state. In the U.K., for example, the permits are referred to as Environmental Permits and are regulated by the U.K. Environment Agency.

These permits require of the permit holder certain operational procedures and practices including management details for unusual occurrences. Some regimes (e.g. Europe and U.S.) also introduce the need to use particular technology (Best Available Technology, or BAT in Europe) which, for example, will produce the least waste, use less hazardous materials, enable recycling etc.

Permits also all require an ongoing monitoring program, with defined targets for many of the variables measured (Table 2). The frequency of the monitoring required can be anything from continuous (dust, vibration and weather, etc.), hourly, daily, weekly, monthly, quarterly, half yearly or annually. Particular sampling may be required around waste rock dumps, tailings facilities and sewage outfalls. Breaches

Table 2

Stage of Mine	Parameters Measured Among Client Companies
Exploration	Area of land disturbed; energy use; dust and noise depending on location.
Construction	Background data before construction begins and comparison during and post-construction. Metals and pH in groundwater; toxicity in surface water; cyanide; sulphate; oil and grease; alkalinity; TOC; bacteriology; conductivity; turbidity; groundwater levels and surface water flows; water temperature; flora and fauna; dust; noise.
Operation	Groundwater depth and quality including metals; dissolved solids; free cyanide; WAD cyanide; pH; conductivity; dissolved oxygen. Surface water includes water flow; taste; Total Petroleum Hydrocarbons; grease; BTEX; total nitrogen and phosphorus; carbonate; bicarbonate; nitrate; sulphate; silicon dioxide; aquatic life (speciation and totals). Land quality may also be measured. Dust; noise and vibration; particulates from stack emissions; Sulphur dioxide; arsenic; spill incidents; meteorological data.
Closure and Aftercare	As above but will include mapping and trends analysis. Revegetation.

need to be addressed and reported to regulators, sometimes within 24 hours of a breach occurring. Remedial measures need to be put in place and repeatedly exceeding a limit or limits can, in extreme cases, result in prosecution and withdrawal of permits. The data also needs to be reported both internally and externally in differing formats and at regular intervals (monthly, quarterly, biannually and annually). Such processes create a large burden on many companies.

Stakeholder Expectation

In addition to statutory permits many companies' stakeholders are also making ever increasing demands that environmental impacts are well managed. Neighbors, for example, are likely to be concerned about the local environment and will not be backward in making their feelings known. In some cases litigation may follow and there are a number of widely reported cases where, for example, blood concentrations of heavy metals in children are high and the finger of blame is pointed at the local mine site. The presence of a robust environmental management approach with supporting data can enable the mine site to mount a staunch defense to such accusations.

Even so, such stories are nothing but bad news and investors may well stay clear of companies blighted in this way. Indeed, there are a number of examples where significant investors in mining companies have withdrawn their stake as a result of environmental performance which might be regarded as poor or even negligent. Conversely, a good level of environmental performance can be attractive to some investors.

The expectations of voters have also resulted in governments in some cases making it obligatory to collect and report nationally on the release of pollution. The National Pollution Inventory (NPI) in Australia, for example, requires qualifying companies to report on the release of 93 substances identified as a result of their potential impacts on the environment and health. Similarly the Toxics Release Inventory in the U.S., born from the Emergency Planning and Community Right to Know legislation, places obligations on industry, including mine sites, to report information; firms have to produce particular reports to fulfil this requirement, such as Discharge Monitoring Reports (DMR). It seems likely that Canadian mine sites will soon also have to report releases from tailings and waste rock under the Canadian National Pollution Release Inventory. In Europe similarly, such data is reported through the European Pollutant Release and Transfer Register (E-PRTR) which contains data reported annually from some 24,000 industrial facilities covering 65 economic activities across Europe.

Company and Industry Values

Much of the increasing drive for environmental performance is consistent with stated company values and many mining companies have on their Web sites details in support of the triple bottom line philosophy. Implicit in this is the organization's focus on social responsibility that brings with it an obligation to report on ecological/environmental and social performance as well as financial performance.

A number of mining companies have achieved accreditation to internationally recognized standards of environmental performance such as ISO 14001. This auditable process requires a company to identify and manage its environmental impacts more broadly than just the mine operation itself and to create a virtuous circle of continuous improvement through setting of objectives and targets, monitoring and review.

There are also examples of sector-specific voluntary programs which aim to manage environmental and other impacts. A good example of this is the International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold (Cyanide Code). Signatories to the code need to meet an auditable standard for cradle-to-grave cyanide management from purchase through operations, training and emergency response including an obligation to implement environmental monitoring programs.

Sustainability

Company values dovetail into sustainability management in many companies and there is no question that sustainability and corporate social responsibility are becoming ever more common as agenda items in boardrooms across the globe. The Global Reporting Initiative (GRI) has invited companies who report on this to submit their reports and GRI makes these records available via its Web site www.globalreporting.org. Since 2000, the number of reports filed has doubled every two years or so. In 2009, for example, 1,289 reports were filed from separate companies with 57 (4.4%) coming from the mining community.

Sustainability is a broader concept than environmental management and a company needs to develop its own Key Performance Indicators. There are various guidelines as to how these should be developed.

Table 3

GRI Examples	Current Sustainability Actions Among Clients
• Raw material used/recycled; • Energy used/saved; • Renewable energy; • Water use and origin; • Water recycled/reused; • Land and biodiversity; • Habitats protected/restored; • Greenhouse gas (GHG) emissions; • Emissions of ozone depleters; • NOx, SOx and other air emissions; • Water discharge; • Waste produced/disposed; • Accidental spills; • Packaging waste; • Permit compliance breaches; and • Transport of goods.	• Develop water management plans; • Develop a biodiversity policy; • Install technology to control mercury emissions; • Certify all sites to ISO 14001; • Implement greenhouse gas management programmes and reporting; • Energy conservation plans and data reporting; • Management plans for environmental incidents and collecting/reporting/analysis of data; • Number of regulator visits community meetings; • Environmental expenditure; • Improvement in waste management approaches particularly for tailings; • Closure and reclamation data; and • Resources used and recycled (water, fuel, oil, grease).

Many EHS Data clients have their own national and sector-specific groups developing these approaches (e.g. the Mining Association of Canada's 'Toward Sustainable Mining' initiative, or MAC TSM). Globally, perhaps the most widely recognized international guidelines are those produced by GRI, which is also producing mining-specific information. Some of these are qualitative whereas others are based on clear data generated within the business. Table 3 illustrates examples of environmental data (taken from the GRI G3 guidelines) as well as that considered by a number of our clients.

Many countries also report data nationally on greenhouse gas emissions. On a voluntary basis the MAC TSM, for example, collects and reports on data from its membership. Reporting on a statutory basis also takes place through emissions trading schemes in both Europe and North America as well as through the pollution release processes discussed earlier. In Australia the *National Greenhouse Gas and Energy Reporting Act 2007* (NGER) has created a national framework for reporting emissions and makes it obligate for companies to report. With the international emphasis on global warming this can only increase.

So How Much Does This Cost?

The drivers for environmental performance are so significant that the question is not so much "what does it cost to do it?" but rather "what does it cost not to do it—in terms of compliance with legislation, managing corporate risk and attracting investors?"

Each year mining companies spend millions of dollars on environmental management and many EHS Data clients spend up to $350,000 per year just on monitoring a single site. With this investment, however, we find frequently that the value in the information that exists is often not realized. Typically, and by default, companies will often begin to collate data in spreadsheet packages but very soon begin to suffer under the weight of large amounts of data collected over many years by different staff, contractors and laboratories. Often nomenclature has become corrupted over time and clients frequently state "our data's in a mess." This means, for example, historical data is often in no condition to present a defense for a company's historical environmental performance. Further, the day-to-day task involving adherence to an obligate data collection reporting timetable is also frequently error prone, labor intensive and costly, as staff struggle to manage data, contractors and regulatory requirements. EHS Data Ltd. has a range of products in use across the world to assist with this task and reduce risk and cost for our clients.

Acknowledgements

Clients assisting in the production of this article include Catherine Wharton of Kalgoorlie Consolidated Gold Mines and president of Goldfields Environmental Management Group (Western Australia); Cheyne Mann of Newmont's Jundee Operation; Ben Ferris of Harmony Gold, Papua New Guinea; and Brent Hamblin of Inmet Mining, Canada.

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